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Status of the T2K Experiment and OTR Detector in the T2K beam line

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The Tokai to Kamioka (T2K) experiment is a long-baseline neutrino experiment. A proton beam generated in Tokai, on the east coast of Japan, collides with a fixed graphite target which produces mesons which decay to neutrinos. A near detector suite located 280 meters from the target and a far detector, Super-Kamiokande, located 295 kilometers from the target on Japan's west coast, are 2.5° off-axis from the incident proton beam direction to optimize neutrino oscillation sensitivity. The appearance of ν_e ($\bar{\nu}_e$) at the far detector from an initial ν_μ ($\bar{\nu}_\mu$) beam can then be used to determine the mixing angles describing neutrino oscillations, as well as the CP-violating parameter δ_{CP} .

As a neutrino experiment, T2K has a large reach in measuring not only the parameters of the neutrino mixing matrix, but also to measure neutrino cross-sections and search for exotic matter. This talk will describe the status of various measurements and searches, and outline recent hardware upgrades.

One recent upgrade is that of the Optical Transition Radiation (OTR) beam monitor, which was designed and built in Canada. Beam monitors in the T2K beam line can measure the primary proton beam position and width, which is key for flux predictions, and provide safety mechanisms to ensure the beam does not hit any critical components. The OTR beam monitor, being just before the T2K target, is crucial in fulfilling both of these purposes.

This talk will provide an overview of how the OTR beam monitor obtains and analyzes this important data for T2K. In addition, improvements that went into the new OTR which was installed in 2022 and includes titanium foils designed for higher intensity will be outlined. Finally, efforts at characterizing and reducing possible background from helium scintillation and secondaries being produced along the beam line.

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Keyword-2

T2K

Keyword-3

Beam Monitor

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